

OPTICAL FREQUENCY SYNTHESIZING STRUCTURE**ABSTRACT OF THE DISCLOSURE**

An Optical Frequency Shifter (Shifter) enables all-optical frequency translation to be imparted on a data-carrying Input Optical Signal (Input Signal). The Shifter includes a first difference-frequency-mixer for achieving quasi-phase-matching between a first pump channel, the Input Signal and an Intermediate Signal. A second difference-frequency-mixer is employed for achieving quasi-phase-matching between a second pump signal, the intermediate signal and a converted signal. A frequency shift discriminates the input signal from the output signal wherein the value of the frequency shift is proportional to the difference in frequencies of the first pump signal and the second pump signal. In this fashion, the value of the frequency shift is independent of the frequency of the input signal. A multiple of Input Signals may be coupled into the Shifter and may be simultaneously shifted to a multiple of respective converted signals wherein the frequency shift has a constant value and discriminates each input signal from each respective converted signal. The Shifter may employ cascaded second harmonic generation (SHG) and difference frequency generation (DFG) thereby enabling the use of pump sources having frequencies generally in the proximity of the frequencies of the Input Signal and Converted Signal. In this fashion, first and second sub-harmonic pump signals may be quasi-phase-matched by the Shifter for achieving SHG thereby generating said first and second pump signals.

A plurality of Shifters may be coupled to each other, thereby enabling a plurality of frequency translations to be imparted on the Input Signals.

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